

2. Abnormal Gills in the Starfish *Porania pulvillus* O. F. M.  
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[Received October 1, 1914: Read February 23, 1915.]

(Text-figure 1.)

The genus *Porania* belongs to the Gymnasteriidae, a family of the Phanerozonia (Sladen, 6, pp. xxxiii, 360). In *P. pulvillus* the disc is large and the arms short, and the actinal and actinal-intermediate areas are flattened, so that they rest more or less closely against any surface to which the starfish is adherent. The margin or boundary between the actinal and abactinal areas forms a sharp angle and is exceptionally well defined owing to (a) the contrast in colour between the white actinal and the crimson abactinal surfaces, and (b) the presence of spines which project horizontally outwards from the margin and are set on the marginal plates. The actinal intermediate plates are very regular and are arranged in short rows, standing out more or less at right angles to the rays, but sloping slightly towards the mouth. Superficially on the actinal epiderm, ciliated grooves overlie the interspaces between the rows of plates. On the abactinal surface near the margin, the papulae or gills come close down to the supero-marginal plates.

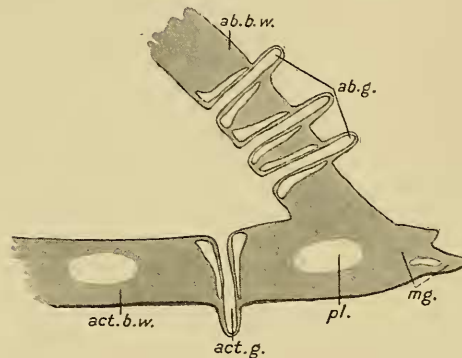
Apart from the superficial grooves above mentioned, the actinal intermediate areas, as a rule, are smooth and destitute of gills, spines, or other growths, except along the margins of the ambulacra, which are bordered by double or triple rows of spines. However, in a preserved specimen from the Millport Marine Station, which I examined for other purposes, there appeared on the actinal surface a set of opaque papillae arranged with no little regularity, one in each of the grooves above mentioned, a short distance inwards from (*i. e.* to the oral side of) the margin. These papillae, being soft, were obviously not spinous in character, but, owing to the thickness and opacity of the body-wall, the question whether they were gills could not be satisfactorily decided by inspection, even after the coelomic cavity was laid open and viewed from inside. Serial sections were accordingly made, and the structures referred to were then found to be perfectly typical papulae or gills. The accompanying figure illustrates somewhat diagrammatically a section, vertical to the marginal edge, showing one of the infra-marginal and three of the supra-marginal gills.

As Joh. Müller first noted (5, p. 163) and as was emphasised later by Sladen (6, p. xxiv), starfish which possess well-developed marginal plates have their papulae or gills limited to that part of the abactinal surface which is bounded by the supero-marginal plates. This provides one of the important distinctions between

the Orders Phanerozonia and Cryptozonia, these Orders being called by Sladen, in consequence, the Stenopneusia and Adetopneusia respectively.

That the division in question is not an altogether natural one has been pointed out by various authorities (*e. g.* Jeffrey Bell, 1, and MacBride, 4). Further, as I have recently proved (2), the larval history of the phanerozontate *Porania* resembles in its essentials that of the typically cryptozontate *Asterias rubens* L. (3), both species having a feeding bipinnarial larva which changes into a brachiolaria and becomes attached at metamorphosis. Probably the occasional presence of infra-marginal gills in *Porania* is

Text-figure 1.



*Porania pulvillus*.

Vertical section through interradial marginal edge, showing the abnormal distribution of gills.

*ab.b.w.*, abactinal body-wall; *ab.g.*, abactinal gills; *act.b.w.*, actinal body-wall; *act.g.*, actinal gill; *pl.*, part of a marginal plate; *mg.*, marginal edge, with spine.

not due directly to atavistic or ancestral causes, but is a parallel manifestation, in an individual belonging to a particular asterid Family, of a tendency or potency which has been fully realised in the various members of numerous other Families.

In any case, the specimen of *Porania* here described\* deserves notice, because, although, as is well known, the Linckiidae (6, p. 397) include genera some of which have, and others have not, actinal gills, no instance of abnormal gill-distribution within a particular phanerozontate species appears to have hitherto been recorded.

\* Three other specimens of *Porania* with actinal gills have recently been obtained at Millport. Several such gills are present in the specimen illustrated in fig. 1, Pl. I. of the preceding paper.

*References.*

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